FINAL REPORT
TO
OFFICE OF NAVAL RESEARCH

DoD Science and Engineering Apprenticeship Program for
High School Students

1996–'97 Activities
Contract No. N00014-96-1-1110

Principal Manager: Dr. Richard L. Pfeffer
Geophysical Fluid Dynamics Institute
The Florida State University
Tallahassee, FL 32306-3017
(904)-644-5594

May 1997
The Florida State University
Tallahassee, Florida

1. INTRODUCTION

The year 1996–'97 represented our fifteenth successful DoD Science and Engineering Apprenticeship Program for High School Students at Florida State University, sponsored by the Office of Naval Research. The program this year was again administered by the Geophysical Fluid Dynamics Institute (GFDI) under the direction of Dr. Richard L. Pfeffer. Student educational activities and work experiences were centered at GFDI.

In the spring of 1996, the guidance counselors of five local high schools were asked to recommend outstanding college-bound students who they thought would benefit most from our program. Ten students were selected to participate starting in the summer of 1996 and thirteen during the school year, 2 of whom were from the summer program, 6 of whom were from last year's program, and 5 new students during the academic year. Our student group consisted of 9 seniors, 7 juniors and 5 exceptional sophomores. The departure from our past concentration on seniors was motivated by our desire to expose students to science and scientific methodology at an earlier age. Some background information concerning the students who were selected appears in the following section. Further information pertaining to each apprentice is attached at the end of the report.

Students spent a total of 30 hours per week with the program for 10 weeks in summer and 10–20 hours per week during the school year. They participated in the research program via data handling and data processing with the aid of computer operated equipment, and in enrichment activities during the summer; including lectures, laboratory demonstrations, scientific films, field trips and a formal course and a weekly discussion session on the history of science using the book *Coming of Age in the Milky Way* by Timothy Ferris. A summary of their activities and projects is included in Section 3.

2. STUDENTS' VITAE

NAME:	Lizza Bailey
RACE:	White
SEX:	Female
HIGH SCHOOL:	Leon High School
ANTICIPATED COLLEGE:	Undecided
ANTICIPATED MAJOR:	Undecided
AWARDS/SCHOLARSHIPS:	
ACTIVITIES/HOBBIES:	

NAME:	Phillip Claiborne
RACE:	White
SEX:	Male
HIGH SCHOOL:	Auscilla Christian School
ANTICIPATED COLLEGE:	Undecided
ANTICIPATED MAJOR:	Undecided
AWARDS/SCHOLARSHIPS:	3rd place Regional Science Fair, A Honor Roll
ACTIVITIES/HOBBIES:	Baseball, Cross Country, Athletics, Weightlifting, Computers

NAME:	Robert Sidney Cox, III
RACE:	Other
SEX:	Male
HIGH SCHOOL:	Leon High School
ANTICIPATED COLLEGE:	University of South Florida
ANTICIPATED MAJOR:	Biology
AWARDS/SCHOLARSHIPS:	Who's Who Among American High School Students, National Merit Scholar, Florida Academic Scholar, USF Excellence Award
ACTIVITIES/HOBBIES:	Ultimate Frisbee

NAME:	Ashish Desai
RACE:	Asian
SEX:	Male
HIGH SCHOOL:	Lincoln High School
ANTICIPATED COLLEGE:	University of Florida
ANTICIPATED MAJOR:	Biochemistry
AWARDS/SCHOLARSHIPS:	National History and Government, Who's Who Among High School Students, Best BIONR Student, NHS Scholarship, Florida Academic Scholarship, 1st place Latin Student, 1st Place History Fair
ACTIVITIES/HOBBIES:	Sports (Baseball, Football, Soccer, Basketball), Disk Jockeying

NAME:	Shannon Dunn
RACE:	Other
SEX:	Female
HIGH SCHOOL:	Godby High School
ANTICIPATED COLLEGE:	FSU
ANTICIPATED MAJOR:	Undecided
AWARDS/SCHOLARSHIPS:	National Honor Society, National French Honor Society, Awards for accounting, English, Drama, Science, Academic Merit; City of Lights

	Winter Festival Jr. Award for Piano, Outstanding Student Awards, Valedictorian of Griffin Middle School (1994), Who's Who of Band and Academics
ACTIVITIES/HOBBIES:	Playing Piano, Saxophone and Flute; Singing, Dancing and Acting in Community Theatre; Horseback Riding, Writing Poetry
NAME:	Allison Eagen
RACE:	White
SEX:	Female
HIGH SCHOOL:	Leon High School
ANTICIPATED COLLEGE:	Undecided
ANTICIPATED MAJOR:	Accounting
AWARDS/SCHOLARSHIPS:	2 Time All Big Bend in Cross-Country, All Big Bend in Track, Secretary of Exchangetts (Service Club), Treasurer of MAT (Math Club), 2nd and 3rd place at French Competition, Treasurer of Pierian (Honor Society)
ACTIVITIES/HOBBIES:	Running, Music, Service Clubs
NAME:	David Henderson
RACE:	White
SEX:	Male
HIGH SCHOOL:	Jefferson County
ANTICIPATED COLLEGE:	Undecided
ANTICIPATED MAJOR:	Undecided
AWARDS/SCHOLARSHIPS:	
ACTIVITIES/HOBBIES:	Working on computers
NAME:	Daanish Hoda
RACE:	Asian
SEX:	Male
HIGH SCHOOL:	Lincoln High School
ANTICIPATED COLLEGE:	FSU
ANTICIPATED MAJOR:	Undecided
AWARDS/SCHOLARSHIPS:	NHS, National Merit Finalist, Salutatorian, State and National Awards in Math and English Achievement
ACTIVITIES/HOBBIES:	Ultimate Frisbee
NAME:	Adrianne Holmes
RACE:	Black
SEX:	Female
HIGH SCHOOL:	Lincoln High School
ANTICIPATED COLLEGE:	Undecided
ANTICIPATED MAJOR:	Chemistry
AWARDS/SCHOLARSHIPS:	National Honor Society, Mu Alpha Theta, Who's Who Among High School Students, National History and Geography Award, First Place District History Fair (1995)
ACTIVITIES/HOBBIES:	Service Club, Youth Choir Member, SADD

NAME:	Mitesh Jivan
RACE:	Asian
SEX:	Male
HIGH SCHOOL:	Godby High School
ANTICIPATED COLLEGE:	Undecided
ANTICIPATED MAJOR:	Undecided
AWARDS/SCHOLARSHIPS:	
ACTIVITIES/HOBBIES:	

NAME:	Tammy Jones
RACE:	Black
SEX:	Female
HIGH SCHOOL:	Godby High School
ANTICIPATED COLLEGE:	Undecided
ANTICIPATED MAJOR:	Veterinarian Medicine
AWARDS/SCHOLARSHIPS:	Honor Roll, Who's Who, Academic G
ACTIVITIES/HOBBIES:	

NAME:	Durga Kode
RACE:	Asian
SEX:	Female
HIGH SCHOOL:	Leon High School
ANTICIPATED COLLEGE:	Undecided
ANTICIPATED MAJOR:	Undecided
AWARDS/SCHOLARSHIPS:	Honor Roll
ACTIVITIES/HOBBIES:	Playing Basket ball

NAME:	Julie Matthews
RACE:	White
SEX:	Female
HIGH SCHOOL:	Leon High School
ANTICIPATED COLLEGE:	University of Florida
ANTICIPATED MAJOR:	Sports Medicine
AWARDS/SCHOLARSHIPS:	Honor Roll
ACTIVITIES/HOBBIES:	Weightlifting, Swimming

NAME:	Marcus Mills
RACE:	Black
SEX:	Male
HIGH SCHOOL:	Godby High School
ANTICIPATED COLLEGE:	Florida State University
ANTICIPATED MAJOR:	Undecided
AWARDS/SCHOLARSHIPS:	FSU Incentive Scholarship, Scholarship Award from Omega Psi Phi, Vocational Gold Seal Scholarship, Varsity Football Letter
ACTIVITIES/HOBBIES:	Music, Sports

NAME:	Vishnu Pabbathi
RACE:	Asian
SEX:	Male
HIGH SCHOOL:	Leon High School
ANTICIPATED COLLEGE:	Undecided
ANTICIPATED MAJOR:	Undecided
AWARDS/SCHOLARSHIPS:	
ACTIVITIES/HOBBIES:	Basketball, Running

NAME:	Keysha Peterson
RACE:	Black
SEX:	Female
HIGH SCHOOL:	Rickards High School
ANTICIPATED COLLEGE:	Undecided
ANTICIPATED MAJOR:	Undecided
AWARDS/SCHOLARSHIPS:	
ACTIVITIES/HOBBIES:	Basketball, Running

NAME:	Terra Sherlock
RACE:	White
SEX:	Female
HIGH SCHOOL:	Leon High School
ANTICIPATED COLLEGE:	Undecided
ANTICIPATED MAJOR:	Physics
AWARDS/SCHOLARSHIPS:	Golden Glove Award (soccer), Sheriff's Ride Along and Shooting Program Awards, 1st Place in 3rd Grade Science Fair
ACTIVITIES/HOBBIES:	1st Sergeant in the Sheriff's Explorers, Vice-President in Nice Science Club, Communications Officer of Phoenix Science Club, Junior Varsity and Varsity Soccer

NAME:	Aruna Subramani
RACE:	Asian
SEX:	Female
HIGH SCHOOL:	Lincoln High School
ANTICIPATED COLLEGE:	University of Florida
ANTICIPATED MAJOR:	Science
AWARDS/SCHOLARSHIPS:	Honor Roll, Special Recognition Award, Academic Awards in English, Social Studies, French; Principal Awards in 9th, 10th, and 11th Grades
ACTIVITIES/HOBBIES:	Traveling

NAME:	Benjamin Switzer
RACE:	White
SEX:	Male
HIGH SCHOOL:	Godby High School
ANTICIPATED COLLEGE:	Undecided
ANTICIPATED MAJOR:	Computer Science
AWARDS/SCHOLARSHIPS:	Honor Roll
ACTIVITIES/HOBBIES:	Martial Arts, Chess, Quotes Collector

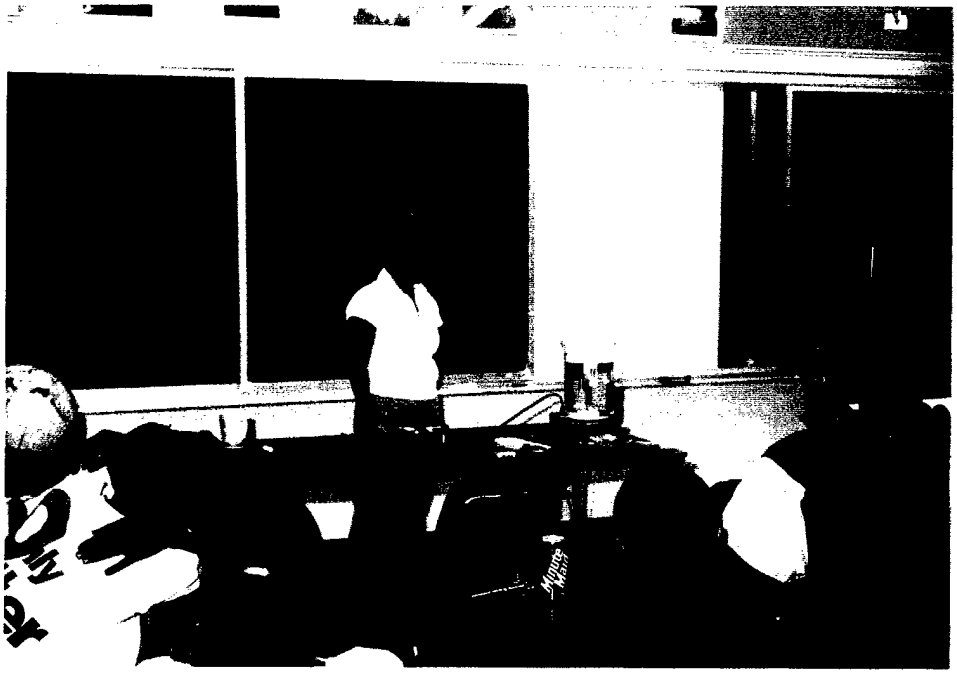
NAME:	Michelle Wallace
RACE:	Black
SEX:	Female
HIGH SCHOOL:	Lincoln High School
ANTICIPATED COLLEGE:	University of Miami
ANTICIPATED MAJOR:	Biology
AWARDS/SCHOLARSHIPS:	National Honor Society, 1995 1st place Leon County History Fair, Biological Institute of ONR Math Award, Biological Institute of ONR Science Award
ACTIVITIES/HOBBIES:	Piano

NAME:	Jereme Wilson
RACE:	Black
SEX:	Male
HIGH SCHOOL:	Godby High School
ANTICIPATED COLLEGE:	Undecided
ANTICIPATED MAJOR:	Undecided
AWARDS/SCHOLARSHIPS:	1st place Public Speaking, 1st place Poetry Contest, Honor Roll, Certificates of Academics, Physical Education Awards, Essay Contest
ACTIVITIES/HOBBIES:	Singing, Writing Poetry

3. STUDENT WORK PROJECTS AND INSTRUCTION

Twenty-one students participated in digitizing velocity vector data from photographs of flow fields obtained in laboratory experiments that simulate the influence of mountains on the atmospheric jet stream, and two assisted in data analysis using computer programs on PCs and the VAX. These activities were part of a larger project on studies of the interaction of bottom topography with overlying baroclinic waves investigated by Drs. R. L. Pfeffer and R. Kung. The students' work was supervised by Mr. Bala B. Kode.

The major project in which the students participated during the summer was the analysis of photographic velocity data from laboratory experiments on the interaction of topography with baroclinic waves. The experiments were conducted in a thermally driven rotating annulus of fluid.



Oceanography Prof. Ruby Krishnamurti (Fellow of the AMS and APS) demonstrates thermal oscillators to the high school student group.

The data from the experiments were obtained by means of a camera, mounted at the top of a rotating annulus of fluid, which recorded the movements of laser-illuminated particles suspended in the fluid. The camera produced a sequence of still photographs; in each photograph the movement of every particle appeared as a string of dots. By digitizing the positions of these dots and calculating the distance between

dots and the orientation of each string of dots, one can determine the velocity field as a function of time. Fourier analyses and energetics calculations of such data provide valuable information about the behavior of baroclinic waves in the presence of bottom topography.

The students had the opportunity to gain experience in the use of digitizing equipment, personal computers, and video monitors which display the work graphically as it is being digitized. They were also able to see and discuss the results of a first-level analysis of the digitized data performed on the GFDI DEC VAX computer cluster. During the course of the summer, the students worked with photographs from several different experiments, which allowed them to see the effects of variations in experimental parameters such as the difference in temperature between the inner and outer walls of the bath, the speed of rotation, and the presence or absence of topographic barriers with different shapes.

The instruction and training given to the high school students concerning their work as apprentices went well beyond that needed to do the job. Efforts were made by the faculty and staff to make their work experience a learning process and an introduction to scientific methodology. Our goal was to ensure the students' understanding of the relationships between theoretical models and observable phenomena, such as the jet stream and ocean currents, (e.g., the Gulf Stream and the Kuroshio Current) which affect the transfer of heat from the tropics to the arctic. This was accomplished by explaining in detail the goals of the program, the scientific methodology, the implications of the experimental and related theoretical results and the contributions of the students' work to the overall project.

4. ENRICHMENT ACTIVITIES

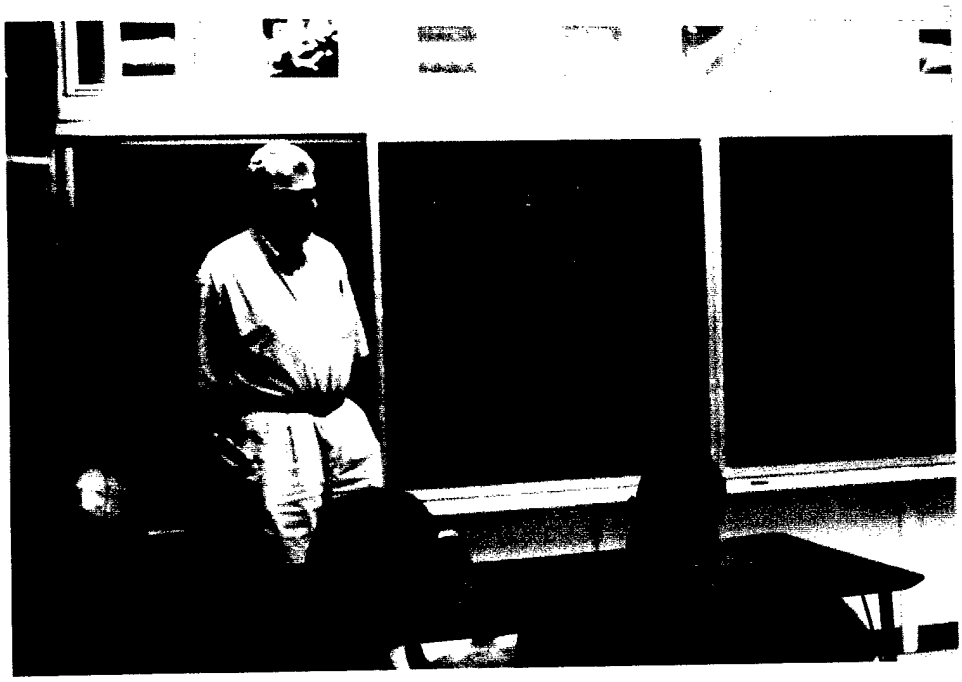
Aside from the students' activities as apprentices, they participated in a variety of other educational activities. These included a series of talks on research topics covering a broad spectrum of scientific disciplines. Talks were given by undergraduate and graduate students Mike Kirby and Scott Applequist, and by Drs. Furbish, Gruender, Kasha, Ruby Krishnamurti, Kung, Long, Loper, Magnan, Pfeffer and Ruscher on topics ranging from the modeling of the Earth's Interior to Flavenoids. In addition, the students

participated in discussions with Dr. Long on *Coming of Age in the Milky Way*, an exciting book on the history and methodology of physical science by Timothy Ferris. A series of scientific films was also selected and shown by Dr. Kung. These covered topics such as astronomy, the strange new science of deterministic chaos, space exploration, atmospheric phenomena, volcanos and others. Drs. Kung and Ruby Krishnamurti also engaged the students in a series of scientific experiments in which different natural phenomena were simulated in the laboratory. A list of these activities is given in Table 1. Dr. Long also took students on field trips to the National Weather Service at the Airport, Channel 27 TV station, the FSU Planetarium, the National Magnet Laboratory and the FSU Nuclear Physics facility.

Ten students also took advantage of another opportunity offered by the program — namely, a course of their choice, with tuition and books paid for by the program. Seven of the students took a Psychology course, one a Nutritional Science class and two a Mathematics course. Eight of these courses were for college credit and two were audited.

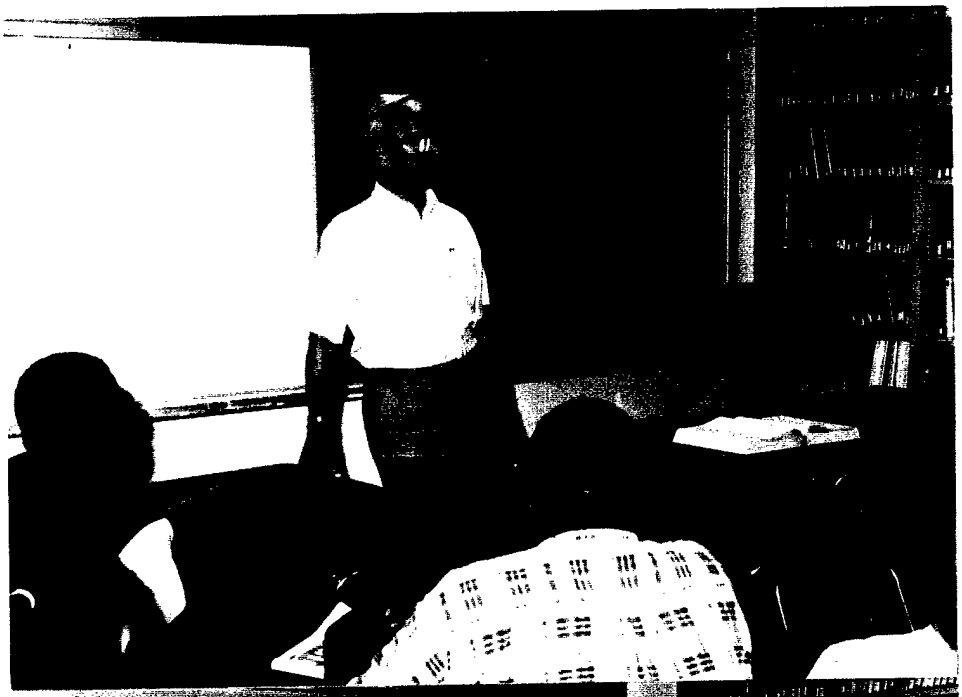
5. CONCLUSION

Questionnaires completed at the end of the summer program of enrichment activities revealed that the students felt that, aside from the monetary rewards, they had benefited a great deal from both the hands-on work experience and the enrichment program. This was especially true of the younger students. They were grateful for the opportunity to work in a scientific environment and acquire new skills and experience. Faculty and staff mentors reported that the students were bright, attentive, well motivated and willing to work. Their contribution to the various projects was also significant. The digitizing work was done carefully and accurately and hence contributed substantially to a much needed data base for further analysis and study.



Philosophy Professor David Gruender discusses the life and scientific accomplishments of Galileo with the high school students.

In general, the students felt financially rewarded and scientifically enriched by their experience in the program. We feel that the students acquired a certain maturity and confidence which should be a great asset to them during their final years in high school, college and their chosen careers.

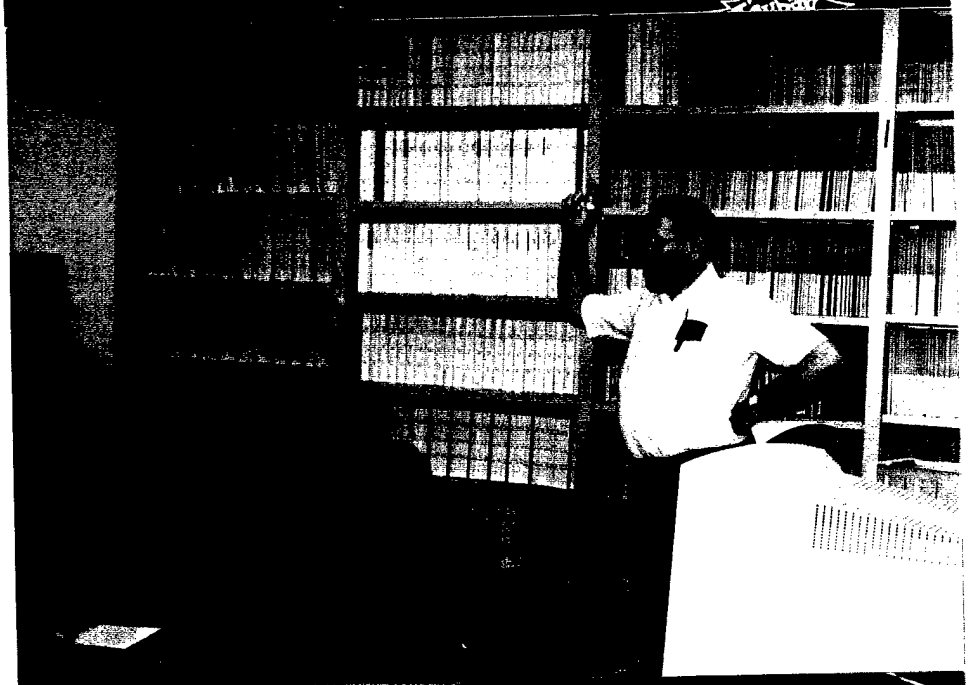


Chemistry Professor Kasha (Member of the National Academy of Sciences) discusses "Flavenoids Flower Color, Lasers and Health" with the high school students.

Distinguished Research Professor Loper explains earth interior processes to the high school students.

Geology Professor Furbish discusses the dynamics of river meanders with the high school students.

Dr. Long conducts a discussion with the high school students of a chapter of the book "Coming of Age in Milky Way" by Timothy Ferris.



Distinguished Research Professor Pfeffer conducts a session entitled "Name that Planet" using JPL photos extracted from the internet.

Mechanical Engineering Professor Buzyna explains apparatus used for laboratory studies of supersonic flow.

1996 ONR/GFDI Summer Enrichment Program Schedule

Time: 2:00 PM to 3:00 PM; **Place:** GFDI Reading Room or as indicated

Monday *Films*	Tuesday *Discussions***	Wednesday *Talks*	Thursday *Lab. Demonstrations*
June 10 (V70492) ***The Shores of the Cosmic Ocean*** (COSMOS Episode 1)	**11** **Dr. Christopher Long** *The Dome of Heaven & Raising the Roof*	**12** **Dr. David Gruender** Galileo and How the World Turns	**13** **Dr. Richard Pfeffer** Welcome
17 (V70495) ***Travels in Space and Time*** (COSMOS Episode 8)	**18** **Dr. Christopher Long** *The Discovery of the Earth*	**19** **Dr. David Furbish** Dynamics of River Meanders	**20** **Dr. Robin Kung** *Laboratory Experiments at GFDI*
24 (V70897) ***Searching for Black Holes*** (The Astronomers Part 2)	**25** **Dr. Christopher Long** *The Sun Worshippers*	**26** **Dr. David Furbish** Bubble Dynamics and Volcanic Eruptions	**27** **Dr. Ruby Krishnamurti** *Rayleigh-Benard Convection*
July 1 (V70900) ***Stardust*** (The Astronomers Part 5)	**2** **Dr. Christopher Long** *The World in Retrograde*	**3** **Dr. Paul Ruscher** Weather Forecasting	**4** **Holiday**
8 ***(Lab. Demo.)*** **Dr. George Buzyna** (at M. E. Lab.) *Supersonic Flow*	**9** **Dr. Christopher Long** *Newton's Reach*	**10** **Dr. Dave Loper** The Earth's Interior	**11** **Dr. Ruby Krishnamurti** *Thermal Oscillators*
15 (F382490) ***Thunder in the Skies*** (Connection 6)	**16** **Dr. Christopher Long** *A Plumb Line to the Sun*	**17** **Dr. Jerry Magnan** Chaos in Plasmas and Water Drops	**18** **Dr. Robin Kung** *Annulus Experiments*
22 (F382520) ***Countdown*** (Connection 9)	**23** **Dr. Christopher Long** *Deep Space*	**24** **Dr. Mike Kasha** Flavenoids: Flower Color, Lasers and Health	**25** **Dr. Ruby Krishnamurti** *Double-Diffusive Instability*
29 (V70306) ***Strange New Science of Chaos*** (NOVA)	**30** **Dr. Christopher Long** *Island Universes*	**31** **Dr. Richard Pfeffer** Name That Planet	**August 1** **Dr. Robin Kung** *Rotating Fluid Flows*
5 (GFDI Video) ***Hawai'i Born of Fire*** (NOVA)	**6** **Dr. Christopher Long** *Einstein's Sky*	**7** **Mr. Mike Kirby** Math Modeling	**8** (F382450) ***(Film)*** ***Death in the Morning*** (Connection 2)
12 (GFDI Video) ***Cyclone*** (National Geographic)	**13** **Dr. Christopher Long** *The Expansion of the Universe*	**14** **Mr. Scott Applequist** Statistical Weather Prediction	**15** **Dr. Ruby Krishnamurti** *Mixing and Unmixing*

* Field Trips will be scheduled for the Fridays of the Summer Program.

** Chapter by chapter discussion of "*Coming of Age in the Milky Way*" by Timothy Ferris, Anchor Books, 1988.

(Suggested Form)

INFORMATION FOR EACH APPRENTICE

1. Name: Bailey (last) Lizza (first)

2. [redacted] PII Redacted

3. School Address, 19 96-'97, if applicable Leon High (name) (904) 488-1971 (phone)
550 Tennessee St.,Tallahassee, FL

4. Expected Major/University Enrolled in: Undecided

5. Last Grade Completed 10 Type of School: (X)Public ( )Private

6. Race/Ethnicity: (Voluntary) ( )Black (X)White ( )Hispanic ( )Asian ( )Other

7. Sex: ( )Male ( )Female WGPA: _____

8. Installation Geophysical Fluid Dynamics Institute, Florida State University (name)

9. Mentor(s): Dr. Robin J. Kung, Associate Scholar/Scientist
Dr. Richard L. Pfeffer, Professor of Meteorology and GFDI Associate
(name) (title)

10. Principal Discipline of Research: Atmospheric Science

11. Major Tasks Performed: Digitizing of velocity vectors from photographs of flow fields obtained in laboratory experiments.

12. Honors, Awards and Scholarships: _____

13. Activities/Hobbies: _____

(Suggested Form)

INFORMATION FOR EACH APPRENTICE

1. Name: Claborne (last) Phillip (first)

2. [redacted]

PII Redacted

3. School Address, 1995-'96, if applicable Auscilla Christian ( ) (name / phone)
Monticello, FL

4. Expected Major/University Enrolled in: _____

5. Last Grade Completed 10 Type of School: ( )Public (X)Private

6. Race/Ethnicity: (Voluntary) ( )Black (X)White ( )Hispanic ( )Asian ( )Other

7. Sex: (X)Male ( )Female WGPA: _____

8. Installation Geophysical Fluid Dynamics Institute, Florida State University (name)

9. Mentor(s): Dr. Robin J. Kung, Associate Scholar/Scientist
Dr. Richard L. Pfeffer, Professor of Meteorology and GFDI Associate (name / title)

10. Principal Discipline of Research: Atmospheric Sciences

11. Major Tasks Performed: Digitizing of velocity vectors from photographs of Flow fields obtained in laboratory experiments.

12. Honors, Awards and Scholarships: 3rd place Regional Science Fair, A Honor Roll.

13. Activities/Hobbies: Baseball, Cross Country, Athletics, Weightlifting, Computers, etc.

(Suggested Form)

INFORMATION FOR EACH APPRENTICE

1. Name: Cox III (last) Robert Sidney (first)

2. [redacted]

PII Redacted

3. School Address, 1995-'96, if applicable Leon High (name) (904) 488-1971 (phone)
550 W. Tennessee St., Tallahassee, FL

4. Expected Major/University Enrolled in: Biology/New College of USF

5. Last Grade Completed 12 Type of School: (X)Public ( )Private

6. Race/Ethnicity: (Voluntary) ( )Black ( )White ( )Hispanic ( )Asian (X)Other

7. Sex: (X)Male ( )Female WGPA: _____

8. Installation Geophysical Fluid Dynamics Institute, Florida State University (name)

9. Mentor(s): Dr. Robin J. Kung, Associate Scholar/Scientist
Dr. Richard L. Pfeffer, Professor of Meteorology and GFDI Associate
(name) (title)

10. Principal Discipline of Research: Atmospheric Sciences

11. Major Tasks Performed: Digitizing of velocity vectors from photographs of flow fields obtained in laboratory experiments.

12. Honors, Awards and Scholarships: Who's Who Among American High School Students, National Merit Scholar, Florida Academic Scholar, USF Excellence Award

13. Activities/Hobbies: Ultimate Frisbee

(Suggested Form)

INFORMATION FOR EACH APPRENTICE

1. Name: Desai (last) Ashish (first)

2. [redacted]

PII Redacted

3. School Address, 19 95-'96, if applicable Lincoln High (name) (904) 487-2110 (phone)
3838 Trojan Trail, Tallahassee, FL

4. Expected Major/University Enrolled in: Biochemistry/University of Florida

5. Last Grade Completed 12 Type of School: (X)Public ( )Private

6. Race/Ethnicity: (Voluntary) ( )Black ( )White ( )Hispanic (X)Asian ( )Other

7. Sex: (X)Male ( )Female WGPA: 4.67

8. Installation Geophysical Fluid Dynamics Institute, Florida State University (name)

9. Mentor(s): Dr. Robin J. Kung, Associate Scholar/Scientist
Dr. Richard L. Pfeffer, Professor of Meteorology and GFDI Associate
(name) (title)

10. Principal Discipline of Research: Atmospheric Sciences

11. Major Tasks Performed: Digitizing of velocity vectors from photographs of flow fields obtained in laboratory experiments.

12. Honors, Awards and Scholarships: National Histroy and Government, Who's Who Among High School Students, Best BIONR student, NHS Scholarship, Florida Academic Scholarship, Ist place Latin Student, Ist Place History Fair.

13. Activities/Hobbies: Playing sports (baseball, football, soccer, basketball), taling to people & helping them w/problems, listening to music and disc jockey.

(Suggested Form)

INFORMATION FOR EACH APPRENTICE

1. Name: Dunn (last) Shannon (first)

2. [redacted]

PII Redacted

3. School Address, 19 95-'96, if applicable Godby High (name) (904) 488-1325 (phone)
1717 W. Tharpe St., Tallahassee, FL

4. Expected Major/University Enrolled in: Undecided/FSU

5. Last Grade Completed 10 Type of School: (X)Public ( )Private

6. Race/Ethnicity: (Voluntary) ( )Black ( )White ( )Hispanic ( )Asian (X)Other

7. Sex: ( )Male (X)Female WGPA: 4.33

8. Installation Geophysical Fluid Dynamics Institute, Florida State University (name)

9. Mentor(s): Dr. Robin J. Kung, Associate Scholar/Scientist
Dr. Richard L. Pfeffer, Professor of Meteorology and GFDI Associate (name / title)

10. Principal Discipline of Research: Atmospheric Science

11. Major Tasks Performed: Digitizing of velocity vectors from photographs of flow fields obtianed in laboratory experiments.

12. Honors, Awards and Scholarships: National Honor Society, National French Honor Society, Awards for Accounting, English, Drama, Science, Academic Merit, etc., City of Lights Winter Festival Jr. Award for Piano, outstanding student Awards, Valedictorian of Griffin Middle School('94), Listed in Who's Who of Bandt Academics

13. Activities/Hobbies: Playing Piano, Saxophone, and flute; singining, dancing and acting in community theatre plays; horseback riding; reading; writing poetry; cleaning, listening to music, going to concerts; working; socializing; doing homework.

(Suggested Form)

INFORMATION FOR EACH APPRENTICE

1. Name: Eagen (last) Allison (first)

2. [redacted]

PII Redacted

3. School Address, 19 95-'96, if applicable Leon High (name) (904) 488-1971 (phone)
500 W. Tennessee Street, Tallahassee, FL

4. Expected Major/University Enrolled in: Accounting/undecided

5. Last Grade Completed 11 Type of School: (X)Public ( )Private

6. Race/Ethnicity: (Voluntary) ( )Black (X)White ( )Hispanic ( )Asian ( )Other

7. Sex: ( )Male ( )Female WGPA: 4.53

8. Installation Geophysical Fluid Dynamics Institute, Florida State University (name)

9. Mentor(s): Dr. Robin J. Kung, Associate Scholar/Scientist
Dr. Richard L. Pfeffer, Professor of Meteorology and GFDI Associate (name / title)

10. Principal Discipline of Research: Atmospheric Science

11. Major Tasks Performed: Digitizing of velocity vectors from photographs of flow fields obtained in laboratory experiments.

12. Honors, Awards and Scholarships: 2nd time All Big Bend in cross country, All Big Bend in Track, Sec. of Exchangettes (service club), Treasurer MAT (Math Club), 2nd & 3rd place at French competition, Treasurer of Pierian (Honor Society).

13. Activities/Hobbies: Running, Music, Service clubs.

(Suggested Form)

INFORMATION FOR EACH APPRENTICE

1. Name: Henderson (last) David (first)

2. [redacted]

PII Redacted

3. School Address, 1996-'97, if applicable Jefferson County High (name) ( ) (phone)
Monticello, FL

4. Expected Major/University Enrolled in: Undecided

5. Last Grade Completed 11 Type of School: (X)Public ( )Private

6. Race/Ethnicity: (Voluntary) ( )Black (X)White ( )Hispanic ( )Asian ( )Other

7. Sex: (X)Male ( )Female WGPA: 3.3

8. Installation Geophysical Fluid Dynamics Institute, Florida State University (name)

9. Mentor(s): Dr. Robin J. Kung, Associate Scholar/Scientist
Dr. Richard L. Pfeffer, Professor of Meteorology and GFDI Associate
(name) (title)

10. Principal Discipline of Research: Atmospheric Science

11. Major Tasks Performed: Computer upgrades and repairs, etc.

12. Honors, Awards and Scholarships: National Beta Club Member

13. Activities/Hobbies: PC hardware/software upgrades, repairs, Sysop of Bulletin Board System (BBS) run from computer at home. Junior Varsity Baseball, Babe Ruth Baseball (Jefferson County Summer Baseball League)

(Suggested Form)

INFORMATION FOR EACH APPRENTICE

1. Name: Hoda (last) Daanish (first)

2. [redacted]

PII Redacted

3. School Address, 19 95-'96, if applicable Lincoln High (name) (904) 487-2110 (phone)
3838 Trojan Trail, Tallahassee, FL

4. Expected Major/University Enrolled in: Undecided/Florida State University

5. Last Grade Completed 12 Type of School: (X)Public ( )Private

6. Race/Ethnicity: (Voluntary) ( )Black ( )White ( )Hispanic (X)Asian ( )Other

7. Sex: (X)Male ( )Female WGPA: 4.73

8. Installation Geophysical Fluid Dynamics Institute, Florida State University (name)

9. Mentor(s): Dr. Robin J. Kung, Associate Scholar/Scientist
Dr. Richard L. Pfeffer, Professor of Meteorology and GFDI Associate (name / title)

10. Principal Discipline of Research: Atmospheric Sciences

11. Major Tasks Performed: Digitizing of velocity vectors from photographs of flow fields obtained in laboratory experiments.

12. Honors, Awards and Scholarships: NHS, National Merit Finalist, Salutatorian, Various State and National Awards in Math, English Achievement.

13. Activities/Hobbies: Pick-up games around neighborhood, ultimate Frisbee.

(Suggested Form)

INFORMATION FOR EACH APPRENTICE

1. Name: Holmes (last) Adrianne (first)

2. [redacted]

PII Redacted

3. School Address, 19 96, if applicable Lincoln High (name) (904) 487-2110 (phone)
3838 Trojan Trail, Tallahassee, FL

4. Expected Major/University Enrolled in: Biology/University of Florida

5. Last Grade Completed 12 Type of School: (X)Public ( )Private

6. Race/Ethnicity: (Voluntary) (X)Black ( )White ( )Hispanic ( )Asian ( )Other

7. Sex: ( )Male (X)Female WGPA: 3.91

8. Installation Geophysical Fluid Dynamics Institute, Florida State University (name)

9. Mentor(s): Dr. Robin J. Kung, Associate Scholar/Scientist
Dr. Richard L. Pfeffer, Professor of Meteorology and GFDI Associate (name / title)

10. Principal Discipline of Research: Atmospheric Science

11. Major Tasks Performed: Digitizing velocity vectors from photographs of flow fields obtained in laboratory experiments.

12. Honors, Awards and Scholarships: National Honor Society, University of Florida Minority Scholarship, Clark Atlanta University Tuition Scholarship, Who's Who Among American High School Students.

13. Activities/Hobbies: Service Club, Youth Choir Member, SADD.

(Suggested Form)

INFORMATION FOR EACH APPRENTICE

1. Name: Jivan (last) Mitesh (first)

2. [redacted]

PII Redacted

3. School Address, 1996-'97, if applicable Godby High School (904) 488-1325 (name / phone)
1717 W. Tharpe St., Tallahassee, FL

4. Expected Major/University Enrolled in: Undecided

5. Last Grade Completed 11 Type of School: (X)Public ( )Private

6. Race/Ethnicity: (Voluntary) ( )Black ( )White ( )Hispanic (4)Asian ( )Other

7. Sex: (X)Male ( )Female WGPA: _____

8. Installation Geophysical Fluid Dynamics Institute, Florida State University (name)

9. Mentor(s): Dr. Robin J. Kung, Associate Scholar/Scientist
Dr. Richard L. Pfeffer, Professor of Meteorology and GFDI Associate (name / title)

10. Principal Discipline of Research: Atmospheric Science

11. Major Tasks Performed: Digitizing of velocity vectors from photographs of flow fields obtained in laboratory experiments.

12. Honors, Awards and Scholarships: _____

13. Activities/Hobbies: _____

(Suggested Form)

INFORMATION FOR EACH APPRENTICE

1. Name: Jones (last) Tammy (first)

2. [redacted]

PII Redacted

3. School Address, 19 95-'96, if applicable Godby High (name) (904) 488-1325 (phone)
1717 W. Tharpe Street, Tallahassee, FL

4. Expected Major/University Enrolled in: Veterinarian Medicine

5. Last Grade Completed 11 Type of School: (X)Public ( )Private

6. Race/Ethnicity: (Voluntary) (X)Black ( )White ( )Hispanic ( )Asian ( )Other

7. Sex: ( )Male (X)Female WGPA: 3.96

8. Installation Geophysical Fluid Dynamics Institute, Florida State University (name)

9. Mentor(s): Dr. Robin J. Kung, Associate Scholar/Scientist
Dr. Richard L. Pfeffer, Professor of Meteorology and GFDI Associate (name / title)

10. Principal Discipline of Research: Atmospheric Science

11. Major Tasks Performed: Digitizing velocity vectors from photographs of flow fields obtained in laboratory experiments.

12. Honors, Awards and Scholarships: Honor roll, published in Who's Who Academic "G", etc.

13. Activities/Hobbies: Shopping, skating talking on phone reading, etc.

(Suggested Form)

INFORMATION FOR EACH APPRENTICE

1. Name: Kode (last) Durga (first)

2. [redacted]

PII Redacted

3. School Address, 19 96-'97, if applicable Leon High (904) (name / phone)
550 Tennessee St., Tallahassee, FL

4. Expected Major/University Enrolled in: Undecided

5. Last Grade Completed 10 Type of School: (X)Public ( )Private

6. Race/Ethnicity: (Voluntary) ( )Black ( )White (X)Hispanic ( )Asian ( )Other

7. Sex: ( )Male (X)Female WGPA: _____

8. Installation Geophysical Fluid Dynamics Institute, Florida State University (name)

9. Mentor(s): Dr. Robin J. Kung,, Associate Scholar/Scientist
Dr. Richard L. Pfeffer, Professor of Meteorology and GFDI Associate (name / title)

10. Principal Discipline of Research: Atmospheric Science

11. Major Tasks Performed: Digitizing of velocity vectors from photographs of flow fields obtained in laboratory experiments.

12. Honors, Awards and Scholarships: _____

13. Activities/Hobbies: _____

(Suggested Form)

INFORMATION FOR EACH APPRENTICE

1. Name: Matthews (last) Julie (first)

2. [redacted]

PII Redacted

3. School Address, 19 96, if applicable Leon High (name) (904) 488-1971 (phone)
500 W. Tennessee Street, Tallahassee, FL

4. Expected Major/University Enrolled in: Sports Medicine/University of Florida

5. Last Grade Completed 12 Type of School: (X)Public ( )Private

6. Race/Ethnicity: (Voluntary) ( )Black (X)White ( )Hispanic ( )Asian ( )Other

7. Sex: ( )Male (X)Female WGPA: 4.0

8. Installation Geophysical Fluid Dynamics Institute, Florida State University (name)

9. Mentor(s): Dr. Robin J. Kung, Associate Scholar/Scientist
Dr. Richard L. Pfeffer, Professor of Meteorology and GFDI Associate (name / title)

10. Principal Discipline of Research: Atmospheric Science

11. Major Tasks Performed: Digitizing of velocity vectors from photographs of flow fields obtained in laboratory experiments.

12. Honors, Awards and Scholarships: Honor roll

13. Activities/Hobbies: Weightlifting, Swimming.

(Suggested Form)

INFORMATION FOR EACH APPRENTICE

1. Name: Mills (last) Marcus (first)

2. [redacted]

PII Redacted

3. School Address, 19 96, if applicable Godby High (name) (904) 488-1325 (phone)
1717 W. Tharpe St., Tallahassee, FL

4. Expected Major/University Enrolled in: Undecided/Florida State University

5. Last Grade Completed 12 Type of School: (X)Public ( )Private

6. Race/Ethnicity: (Voluntary) (X)Black ( )White ( )Hispanic ( )Asian ( )Other

7. Sex: (X)Male ( )Female WGPA: 3.7

8. Installation Geophysical Fluid Dynamics Institute, Florida State University (name)

9. Mentor(s): Dr. Robin J. Kung, Associate Scholar/Scientist
Dr. Richard L. Pfeffer, Professor of Meteorology and GFDI Associate
(name) (title)

10. Principal Discipline of Research: Atmospheric Science

11. Major Tasks Performed: Digitizing of velocity vectors from photographs of flow fields obtained in laboratory experiments.

12. Honors, Awards and Scholarships: FSU Incentive Scholarship, Scholarship Award from Omega Psi Phi, Vocational Gold Seal Scholarship, Varisity Football letter.

13. Activities/Hobbies: Music, reading, sports

(Suggested Form)

INFORMATION FOR EACH APPRENTICE

1. Name: Pabbathi (last) Vishnu (first)

2. [redacted]

PII Redacted

3. School Address, 19 96, if applicable Leon High (name) (904) 488-1971 (phone)
500 W. Tennessee Street, Tallahassee, Florida

4. Expected Major/University Enrolled in: Undecided

5. Last Grade Completed 10 Type of School: (X)Public ( )Private

6. Race/Ethnicity: (Voluntary) ( )Black ( )White ( )Hispanic (X)Asian ( )Other

7. Sex: (X)Male ( )Female WGPA: 3.71

8. Installation Geophysical Fluid Dynamics Institute, Florida State University (name)

9. Mentor(s): Dr. Robin J. Kung, Associate Scholar/scientist
Dr. Richard L. Pfeffer, Professor of Meteorology and GFDI Associate (name / title)

10. Principal Discipline of Research: Atmospheric Science

11. Major Tasks Performed: Working on the computer and printing out plots of the laboratory experiments

12. Honors, Awards and Scholarships:

13. Activities/Hobbies: Playing Basketball, running.

(Suggested Form)

INFORMATION FOR EACH APPRENTICE

1. Name: Peterson (last) Keysha (first)

2. [redacted]

PII Redacted

3. School Address, 19 96-'97, if applicable Rickards (name) (904) 488-1783 (phone)
3013 Jim Lee Rd., Tallahassee, FL

4. Expected Major/University Enrolled in: Undecided

5. Last Grade Completed 11 Type of School: (X)Public ( )Private

6. Race/Ethnicity: (Voluntary) (2)Black ( )White ( )Hispanic ( )Asian ( )Other

7. Sex: ( )Male (X)Female WGPA: _____

8. Installation Geophysical Fluid Dynamics Institute, Florida State University (name)

9. Mentor(s): Dr. Robin J. Kung, Associate Scholar/Scientist
Dr. Richard L. Pfeffer, Professor of Meteorology and GFDI Associate
(name) (title)

10. Principal Discipline of Research: Atmospheric Science

11. Major Tasks Performed: Digitizing of velocity vectors from photographs of flow fields obtained in laboratory experiments.

12. Honors, Awards and Scholarships: _____

13. Activities/Hobbies: _____

(Suggested Form)

INFORMATION FOR EACH APPRENTICE

1. Name: Sherlock (last) Terra (first)

2. [redacted]

PII Redacted

3. School Address, 19 96, if applicable Leon High (name) (904) 488-1971 (phone)
500 Tennessee Street, Tallahassee, FL

4. Expected Major/University Enrolled in: Physics

5. Last Grade Completed 12 Type of School: (X)Public ( )Private

6. Race/Ethnicity: (Voluntary) ( )Black (X)White ( )Hispanic ( )Asian ( )Other

7. Sex: ( )Male (X)Female WGPA: 3.2

8. Installation Geophysical Fluid Dynamics Institute, Florida State University (name)

9. Mentor(s): Dr. Robin J. Kung, Associate Scholar/Scientist
Dr. Richard L. Pfeffer, Professor of Meteorology and GFDI Associate
(name) (title)

10. Principal Discipline of Research: Atmospheric Science

11. Major Tasks Performed: Digitizing of velocity vectors from photographs of flow fields obtained in laboratory experiments.

12. Honors, Awards and Scholarships: Golden Glove Award (Soccer), Sheriff's Ride-Along and Shooting Program Awards, Ist Place in 3rd grade Science Fair.

13. Activities/Hobbies: Ist Seargent in the Sheriff's Explorers, Vice-President in Nice Science Club, Communication Officer of Phoenix Science Club, Junior Varsity and Varsity Soccer.

(Suggested Form)

INFORMATION FOR EACH APPRENTICE

1. Name: Subramani (last) Aruna (first)

2. [redacted]

PII Redacted

3. School Address, 19 96, if applicable Lincoln High (name) (904)487-2110 (phone)
3838 Trojan Trail, Tallahassee, FL

4. Expected Major/University Enrolled in: Science at University of Florida

5. Last Grade Completed 11 Type of School: (X)Public ( )Private

6. Race/Ethnicity: (Voluntary) ( )Black ( )White ( )Hispanic (X)Asian ( )Other

7. Sex: ( )Male (X)Female WGPA: 4.57

8. Installation Geophysical Fluid Dynamics Institute, Florida State University (name)

9. Mentor(s): Dr. Robin J. Kung, Associate Scholar/Scientist
Dr. Richard L. Pfeffer, Professor of Meteorology and GFDI Associate (name, title)

10. Principal Discipline of Research: Atmospheric Science

11. Major Tasks Performed: Digitizing of velocity vectors from photographs of flow fields obtained in laboratory experiments.

12. Honors, Awards and Scholarships: Honor Roll, Special Recognization Award, Academic Awards- English, Social Studies, French, etc. Principal Awards- 9th, 10th, 11th grade.

13. Activities/Hobbies: Like to travel

(Suggested Form)

INFORMATION FOR EACH APPRENTICE

1. Name: Switzer (last) Benjamin (first)

2. [redacted]

PII Redacted

3. School Address, 19 96, if applicable Godby High (name) (904) 488-1325 (phone)
1717 W. Tharpe St., Tallahassee, FL

4. Expected Major/University Enrolled in: Undecided

5. Last Grade Completed 12 Type of School: (x)Public ( )Private

6. Race/Ethnicity: (Voluntary) ( )Black (x)White ( )Hispanic ( )Asian ( )Other

7. Sex: (x)Male ( )Female WGPA: 3.7

8. Installation Geophysical Fluid Dynamics Institute, Florida State University (name)

9. Mentor(s): Dr. Robin J. Kung, Associate Scholar/Scientist
Dr. Richard L. Pfeffer, Professor of Meteorology and GFDI Associate
(name) (title)

10. Principal Discipline of Research: Atmospheric Science

11. Major Tasks Performed: Computer Maintenance

12. Honors, Awards and Scholarships: Honor Roll

13. Activities/Hobbies: Martial Arts, Chess and quotes collector.

(Suggested Form)

INFORMATION FOR EACH APPRENTICE

1. Name: Wallace (last) Michelle (first)

2. [redacted]

PII Redacted

3. School Address, 19 96, if applicable Lincoln High (name) (904) 487-2110 (phone)
3838 Trojan Trail, Tallahassee, FL

4. Expected Major/University Enrolled in: Biology, University of Miami, FL

5. Last Grade Completed 12 Type of School: (X)Public ( )Private

6. Race/Ethnicity: (Voluntary) (X)Black ( )White ( )Hispanic ( )Asian ( )Other

7. Sex: ( )Male (XX)Female WGPA: 4.46

8. Installation Geophysical Fluid Dynamics Institute, Florida State University (name)

9. Mentor(s): Dr. Robin J. Kung, Associate Scholar/Scientist
Dr. Richard L. Pfeffer, Professor of Meteorology and GFDI Associate (name / title)

10. Principal Discipline of Research: Atmospheric Science

11. Major Tasks Performed: Digitizing of velocity vectors from photographs of flow fields obtained in laboratory experiments.

12. Honors, Awards and Scholarships: National Honor Society
1995 Ist Place Leon County History Fair, Biological Institute of ONR Math Award, Biological Institute of ONR Science Award.

13. Activities/Hobbies: Piano, Reading.

(Suggested Form)

INFORMATION FOR EACH APPRENTICE

1. Name: Wilson (last) Jereme (first)

2. [redacted]

PII Redacted

3. School Address, 19 96, if applicable Godby High (name) (904) 488-1325 (phone)

1717 W. Tharpe Street, Tallahassee, FL

4. Expected Major/University Enrolled in: Undecided

5. Last Grade Completed 11 Type of School: (X)Public ( )Private

6. Race/Ethnicity: (Voluntary) (X)Black ( )White ( )Hispanic ( )Asian ( )Other

7. Sex: (X)Male ( )Female WGPA: _____

8. Installation Geophysical Fluid Dynamics Institute, Florida State University (name)

9. Mentor(s): Dr. Robin J. Kung, Associate Scholar/Scientist
Dr. Richard L. Pfeffer, Professor of Meteorology and GFDI Associate. (name) (title)

10. Principal Discipline of Research: Atmospheric Science

11. Major Tasks Performed: Digitizing of velocity vectors from photographs of flow fields obtained in laboratory experiments.

12. Honors, Awards and Scholarships: Ist place public speaking, Ist place Poetry Contest, Honor Roll, Certificates of Academics, P.E. Awards, Essay contest.

13. Activities/Hobbies: sing, write and read poetry.

INFORMATION FOR EACH MENTOR

1. Name: Kung (last) Robin (first)

2. Installation: Florida State University, Geophysical Fluid Dynamics Institute (name)

(904) 644-5594 (phone)

3. [redacted]

PII Redacted

4. Sex ( ) Female (X) Male

5. Race/Ethnicity: (Voluntary) ( )Black ( )White ( )Hispanic (X)Asian ( )Other

6. Highest Degree Earned: Ph.D.

7. Principal Field of Research: Geophysical Fluid Dynamics

8. Number of Years of Mentorship: 12

9. Number of Apprentices Supervised this Year, 1996 : 10

INFORMATION FOR EACH MENTOR

1. Name: Long (last) Christopher (first)

2. Installation: Florida State University, Geophysical Fluid Dynamics Institute (name)

(904) 644-5594 (phone)

3. [redacted]

PII Redacted

4. Sex ( ) Female (X) Male

5. Race/Ethnicity: (Voluntary) ( )Black (XX)White ( )Hispanic ( )Asian ( )Other

6. Highest Degree Earned: Ph.D.

7. Principal Field of Research: Atmopsheric Science

8. Number of Years of Mentorship: 3

9. Number of Apprentices Supervised this Year, 1996 : 10

INFORMATION FOR EACH MENTOR

1. Name: Pfeffer (last) Richard (first) L.

2. Installation: Florida State University, Geophysical Fluid Dynamics Institute (name)

(904) 644-5594 (phone)

3. [redacted]

PII Redacted

4. Sex ( ) Female (X) Male

5. Race/Ethnicity: (Voluntary) ( )Black (XX)White ( )Hispanic ( )Asian ( )Other

6. Highest Degree Earned: Ph.D.

7. Principal Field of Research: Meteorology and Geophysical Fluid Dynamics

8. Number of Years of Mentorship: 14

9. Number of Apprentices Supervised this Year, 1996 : 12

INFORMATION FOR EACH MENTOR

1. Name: Kode (last) Bala (first)

2. Installation: Geophysical Fluid Dynamics Institute (name)

644-5594 (phone)

3. [redacted]

PII Redacted

4. Sex ( ) Female (X) Male

5. Race/Ethnicity: (Voluntary) ( )Black ( )White ( )Hispanic (X)Asian ( )Other

6. Highest Degree Earned: Undergraduate Student

7. Principal Field of Research: Atmospheric Science

8. Number of Years of Mentorship: 1

9. Number of Apprentices Supervised this Year, 1996-'97: 21

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Tallahassee, FL 32306-3017

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13. ABSTRACT (Maximum 200 words)

In the spring of 1996, the guidance counselors of five local high schools were asked to recommend outstanding college-bound students who they thought would benefit most from our program. Ten students were selected to participate starting in the summer of 1996 and thirteen during the school year, 2 of whom were from the summer program, 6 of whom were from last year's program, and 5 new students during the academic year. Our student group consisted of 9 seniors, 7 juniors and 5 exceptional sophomores. The departure from our past concentration on seniors was motivated by our desire to expose students to science and scientific methodology at an earlier age. Some background information concerning the students who were selected appears in the following section. Further information pertaining to each apprentice is attached at the end of the report.

Students spent a total of 30 hours per week with the program for 10 weeks in summer and 10–20 hours per week during the school year. They participated in the research program via data handling and data processing with the aid of computer operated equipment, and in enrichment activities during the summer; including lectures, laboratory demonstrations, scientific films, field trips and a formal course and a weekly discussion session on the history of science using the book *Coming of Age in the Milky Way* by Timothy Ferris. A summary of their activities and projects is included in Section 3.

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